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INKING ROLLER WITH STRUCTURED SURFACE

The present invention pertains to an inking roller, whose ink-transferring surface is structured, to an inking system, especially a film-type inking system, with a duct roller and with an inking roller according to the present invention, which takes up the ink from the ductor, and to a rotary offset printing couple with the inking roller and all components for transferring a printed image. The present invention pertains, in particular, to web printing.

It is known that a water-ink emulsion with high water content may be formed in the pinking system during offset printing on areas of the plate that are free from image or carry little ink, and this emulsion causes streaky differences in ink management there. Since the emulsion with high water content cannot be distributed any longer by the changing distributor roller because the distributor roller slips away over it, streaky fields with too much emulsified ink will form in the inking system during the operation of the press. This happens especially in film-type inking systems in which the ink splitting process of the ink is less intense because of the small gap that is always present between the duct roller and the film roller and therefore leads to toning of the printing plate and to undesired spraying of the ink.

Furthermore, it is known that especially in high-speed rotary offset presses, moistening agents split

back into the inking system from the printing plate via the transfer rollers. The film roller as the last roller in the roller train, located at a short distance from the duct roller, cannot further split any moistening agent.

Circumferential water rings are formed on the hydrophilic film roller surface with flute-shaped recesses provided in the circumferential direction. The water rings building up compensate the distance from the adjacent duct roller, so that moistening agent reaches the ink duct via the duct roller. The homogeneous ink film on the duct roller is disturbed and the ink transfer up to the plate cylinder is adversely affected.

The moistening agent evaporation time, which becomes shorter in high-speed offset printing presses, has another adverse effect on the quantity of moistening agent in the ink duct.

One object of the present invention is to avoid the presence of moistening agent on the ink-carrying rollers more extensively than before.

This is achieved according to the present invention in that at least one film or fluted roller of the inking system, which said roller adjoins the duct roller, which will hereinafter also be called simply inking roller, is provided in the ink delivery direction with a profiled jacket surface that brings about the ink film in the circumferential and axial directions. The continuous lateral distribution of the printing ink and the water rings forming in the circumferential direction on the amount of ink film [sic - Tr.Ed.] are prevented by this measure from occurring nearly completely without an additional effort.

Even though it is known that the surface of ink film rollers can be designed as a sinusoidal fluted roller, these flutes, which are closed in themselves in the circumferential direction, do permit circumferential water rings to be formed.

Furthermore, it is known that film rollers can be provided with a diagonally knurled roller profile. The fine, sharp-edged grids on the jacket surface may cause ink splashes on the adjacent parts of the press in high-speed printing presses. The cleaning of the fine depressions of the grids to remove printing ink is also complicated.

Furthermore, the longitudinal profiling of the jacket surface of ink film rollers in the axial direction with a slope angle in relation to the axis of rotation has been known in this area of the printing industry. These rollers tend to be characterized by a continuous lateral ink shift on the jacket surface (e.g., DE 39 32 694, EP 425 829, DE 40 28 417, US 2 369 814).

For improvement, the jacket surface of at least one of the inking rollers is provided with a profile according to the present invention in the inking system of an offset printing press, which profile

REPLACEMENT PAGE

may have especially sinusoidal flutes in the circumferential direction and especially straight flutes in the axial direction, with a slope angle in relation to the axis of rotation.

The roller profile according to the present invention is preferably prepared by grinding or milling.

The advantages in case of

- preferably at least 18 longitudinal flutes with a slope angle greater than 0° to 30° and preferably 10° in relation to the axis of rotation and
- a plurality of longitudinal flutes, preferably sinusoidal flutes with an amplitude of about 4.75 mm and a degree of overlap of about 1.9 *(9.5/4.75)* are:
- No splitting of moistening water from the ink film roller to the ink ductor or into the ink duct, and consequently homogeneous ink film formation on the ductor, especially at high press speeds (>10 m/sec);
- the interrupted flute structure prevents circumferential moistening water rings or surface water from forming;
- pre-moistening or after-moistening is possible;
- continuous, "beat-free milling off of ink" from the ductor;
- no lateral ink transport on one side in the axial direction of the inking roller;
- no regrinding of the inking roller diameter;
- inking rollers with existing sinus profile can be retrofitted;
- no complicated cleaning.

The circumferential and longitudinal flutes should be arranged in a uniform distribution over the

circumference of the ink-transferring surface and form a regular surface structure.

The film roller is used for continuous ink feed into the inking system. It is a steel or plastic-coated roller with surface structure. The profiling is necessary to enable this roller to "mill off" an ink film from the ductor. The film roller is contactless in relation to the ductor.

It has a circumferential velocity corresponding to the velocity of the web. The velocity of the ductor is several times lower.

The advantages of a film roller over a vibrating roller are that the ink transfer takes place continuously rather than intermittently.

Inking systems can thus be made shorter because the ink transfer, which is intermittent in case of vibrating roller type inking systems, does not need to be compensated by a long inking system.

A great variety of profiled rollers are known:

- fluted rollers,
- corrugated or diagonally knurled rollers,
- longitudinally corrugated rollers, etc.

Longitudinally corrugated surfaces lead to intermittent ink transfer. Surfaces structured too fine are difficult to clean and tend to increased spraying.

Novel Film Roller Profile

Requirements:

- continuous surface structure,
- minimum roller surface,
- no closed surfaces extending circumferentially in one plane,
- possibility of good cleaning,
- manufacture at low cost.

The homogeneously structured roller surface consisting of a combination of a circumferential profiling and a longitudinal profiling.

The lamellar structure thus left guarantees continuous, clean and reproducible ink transfer and extensively prevents the splitting of moistening agent into the ink ductor/ink film roller ink transfer zone.

Figure 1 shows an offset printing couple of a rotary printing press. The printing couple comprises a printing form cylinder or plate cylinder 13, a rubber blanket cylinder 14 and an inking and dampening system. The inking system of the printing couple comprises an ink duct 10, a ductor roller 11, a doctor blade bar 12 engaged with the ductor roller 11, a film or fluted roller 1 and other ink transfer rollers between the film or fluted roller 1 and the printing form cylinder 13. With a mating cylinder 15, the rubber blanket cylinder 14 forms a printing gap, in which a web B passing through is printed on on one side or on both sides.

The film or fluted roller 1 is shown individually in Figure 2. It comprises a roller body with an ink-transferring roller surface S and a roller pin 2 each at its two axial ends for the rotary mounting of the roller 1 about its axis of rotation R. The ink-transferring surface S is structured according to the present invention, as it is indicated for the left-hand axial end of roller 1 in Figure 2.

Figure 3 shows an axial section of the surface S. The surface S is structured by circumferential flutes 3 located in parallel to and at spaced locations from one another along the axis of rotation R and essentially axially extending longitudinal flutes 4, which are likewise parallel to one another. The elevated surface areas or webs 5 left between the circumferential flutes 3 and longitudinal flutes 4 have a length of about 9 mm each, measured in the circumferential direction, i.e., in the layout at right angles to the axis of rotation R. The circumferential flutes 3 extend in a wave-shaped pattern over the circumference, as a sine wave with a valley and a peak in the exemplary embodiment, The amplitude measured in parallel to the axis of rotation R is about 5 mm, i.e., the distance between the peak and valley is approx. 10 mm. The pitch, changing because of the sinusoidal course over the circumference and expressed by the slope angle α measured in relation to the axis of rotation R, varies over the circumference between 90° and about 87°. The slope angle ß, at which the longitudinal flutes 4 are sloped in relation to the axis of rotation R, is approx. 10°.

Figure 4 shows the profile of two adjacent circumferential flutes 3.

Figure 5 shows the profile of two adjacent longitudinal flutes 4.

The webs 5 are sharp-edged.

Preferred parameters of the surface structure are also presented below:

Circumferential Profile

- Closed circumferential flute profile with a groove width s1, a flute shape R1 and a groove depth t.
- The circumferential flute describes a sine curve with an amplitude of 0 mm to 50 mm and preferably 4.75 mm.
- The degree of overlap is the ratio of the flute width to the amplitude and is between 1.6 and 2.4. Preferably 2.0.
- The groove depth is between 0.5 mm and 1 mm. Preferably 0.6 mm.
- The distances a1 between the flutes are between 1 mm and 5 mm. Preferably <3 mm.

Longitudinal Profile

- The longitudinal profile with a groove width s2, a flute shape R2 and a groove depth t is similar to the profile of the circumferential flute.
- The angle of slope ß in relation to the axis of rotation is between 0° and 30°. Preferably <10°.

Surface Structure

The combination of the number of circumferential and longitudinal flutes is selected to be such that the remaining jacket surface $\sum A$ is between 10% and 20% of the total roller surface.

Roller Material

Steel body with plastic-coated roller jacket, e.g., hard rubber, polyamide, polyurethane, etc.